IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No.	: 10/628,085	Confirmation No. 3521
Applicant	: Dennice F. GAYME et al.	
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Examiner	: R.M. Mancho	
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Customer No.	: 000128	

ARGUMENTS ACCOMPANYING PRE-APPEAL BRIEF REQUEST FOR REVIEW

I. Status of Claims

Claims 1, 2, 5-7, 9-11, 21, 25, 26, 28-31, 33, 34, 36-48 are pending in this application, with Claims 1, 21, 31, and 39 being the independent claims, and claims 2, 21, 25 and 28-30 are withdrawn from consideration. In general, the claimed invention is directed toward a system for detecting faults in a turbine engine. The fault detection system includes a sensor data processor that receives engine sensor data during operation and augments the sensor data by generating residuals from the sensor data and determining a rate of change of the residuals. The augmented data set is received by a fuzzy logic inference system that includes a plurality of membership functions. The fuzzy logic system fuzzifies the augmented data set using the plurality of membership functions and analyzes the augmented data set to determine a likelihood that a fault has occurred in the turbine engine.

II. Rejections under 35 U.S.C. § 112

In the final office action dated November 27th, 2007, claims 11, 31, 33, 34 and 36-38 were rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the enablement requirement. Specifically, with regard to claims 11 and 38, the Examiner objected to the term "margin", stating that it is unclear in what manner "a margin" related to "augment the sensor data". Applicants again disagree, and submit that the relationship is sufficiently clear. First, the recited margin of the exhaust gas temperature is described in the specification as the difference between the current operating temperature and the temperature redline for a

particular engine model. See paragraph 0036 of applicants' specification. Second, the specification repeatedly describes **calculating a margin as one technique that can be used to augment the sensor data**. See paragraph 0024 as one example, which states "The residual data can be augmented using a variety of techniques, such as by determining the rate of change of residual data or determining margin levels". Thus, the specification clearly describes the relationship between margin and augmenting sensor data, and thus clearly satisfies the enablement requirement.

With regard to claims 31, 33, 34, 36 and 37, the Examiner has provided no basis for the rejection under 35 U.S.C. § 112, first paragraph. Instead, the Examiner only states that these claims are rejected for depending upon a rejected base claim or for having the rejected deficiency. Applicants submit that this is clearly incorrect. First, none of the claims 31, 33, 34, 36 and 37 depend from either claim 11 or claim 38. Second, of these claims, only 34 recites the term "margin", and this claim clearly recites that the sensor data is augmented by "determining exhaust gas temperature margin data corresponding to a difference between the exhaust gas temperature data and a selected maximum safe exhaust gas temperature for the turbine engine". Thus, applicants submit that the rejections under 35 U.S.C. § 112, first paragraph are clearly improper and should be withdrawn.

In the office action, claims 1, 5-7, 9-11, 31, 33, 34 and 36-45 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. With regard to claims 1, 31 and 39, the Examiner stated that it was not clear what is meant by the term "likelihood". Furthermore, in response to Applicants' previous arguments, the Examiner states that even if the term probability was used, it would still be indefinite because the Applicant does disclose if the probability was 2%, 5%, or a given level by which the probability is determined to indicate that there will be fault in the engine.

Applicants respectfully disagree, and again submit that the term "likelihood" merely follows the accepted definition of the term, e.g., a probability. Thus, the recited phrase "determine a likelihood that a fault has occurred in the turbine engine" means determining a probability (by any measure) that a fault has occurred. There is no requirement that the determined likelihood of fault be compared to any particular level as was alleged by the Examiner. Instead, it is sufficient that any measure of the likelihood of fault be determined.

With regard to claims 1, 31 and 39, the Examiner stated that it was not clear what is meant by the term "data type". Applicants respectfully disagree, and submit that these terms of appropriately clear. Specifically, the term "data type" simply means a type of data. Examples of types of data for which membership functions can be created are described in detail in applicant's specification. See paragraphs 0053-0055..

With regard to claims 11 and 34, the Examiner stated that it was not clear what all is meant and encompassed by a "maximum safe temperature", alleging that the term "maximum safe" is indefinite in the claim, and the scope of the claim is uncertain. Applicants disagree, and submit that the scope of the claim is clear when properly interpreted in light of the specification. Specifically, the specification at paragraph 0036 specifically describes one method of the EGT margin being calculated. This example states that the EGT margin represents the number of degrees between the current operating conditions and the "temperature redline for that particular engine model", where the engine's redline is generally a "safety limit on temperature for the engine's operation". Thus, the maximums safe temperature is simple a temperature limit set for the operation of the turbine engine, above which the safety of the engine could be comprised. Taken in this context, the use of the term "maximum" clearly is well defined and meets the requirements under section 112.

III. Rejections under 35 U.S.C. § 102 and 103

Claims 1, 5-7 and 9-11 were rejected under 35 U.S.C. § 102(e) as allegedly being anticipated by U.S. Patent Publication No. 2003/0139860 to McBrien et al, hereinafter McBrien. Applicants respectfully disagree, and submit that the claims are patentably distinct over the cited McBrien reference. Applicants note that the claim 1 recites that the sensor data processor augments the sensor data by generating **residuals from the sensor data**, where residuals are defined in the specification as the difference between the sensor data and the expected values of the sensor data. Claim 1 further recites that the sensor data processor determines the **rate of change of the residuals**. Applicants submit that neither the calculation of residuals nor the rate of change of residuals is taught by McBrien.

First, with regard to the sensor data processor, the Examiner alleged that elements 14 and 16 of McBrien constitute the recited sensor data processor. Specifically, the Examiner cites the McBrien as teaching the calculation of residuals in filtering or conditioning data in paragraphs 0050 and 0051.. Furthermore, the Examiner cites the McBrien as teaching a rate

of change of the residuals in the form of a "horsepower deviation rate". See page 4 of the final office action dated November 27th, 2007.

Applicants submit that this is a misreading of the reference. First, there no indication that filtering or conditioning sensor data is the same as the calculation of residuals, as there is no indication that it involves any sort of comparison with expected values of the sensor data. Second, applicants note that McBrien does not disclose a "deviation rate" but instead discloses a "deviation ratio". (emphasis added). The words "deviation rate" are not found in McBrien. While a rate may be one type of ratio, there is no hint in McBrien that the described deviation ratio is any type of rate, a **rate of change** in general, or a **rate of change of sensor data residuals** in specific. Applicants thus submit that this part of the rejection is based on a misinterpretation of McBrien, and that the reference fails to teach the recited limitations.

With regard to units 45 of FIG. 5 in McBrien, these are clearly not indications that McBrien teaches the recited use of the rate of change of residuals. Instead, the units 45 are merely described as "performance maps" in McBrien. Contrary to the assertion by the Examiner, the mere presence of graphs inside units 34 do not imply that the rate of change of any sensor data residuals is calculated. With regard to paragraph 0069 of McBrien, this again merely describes the use of ratiometric comparision to determine which sensors have the largest deviation and should be disabled. It again says nothing about any **rate of change** in general, or the **rate of change of sensor data residuals** in particular.

Second, with regard to the fuzzy logic inference system, the Examiner alleged that element 30 of McBrien constituted this element. Applicants again disagree. While FIG. 3 of McBrien does label element 30 using the phrase "fuzzy logic calculations", it is merely described as performing calculations relating to bypass, stopping or enabling the fault detection system. See FIG. 4 and paragraphs 0046-0048 of McBrien. For example, these sections describe how the element 30 determines if there are sufficient sensors available, and if not the fault detection logic is bypassed. Additionally, element 30 is described as determining the engine operating mode and likewise bypasses the fault detection logic if the engine is not in normal or combat roles. See paragraph 0047 of McBrien.

In contrast, applicants independent claims recite that the fuzzy logic inference system includes a plurality of membership functions and is configured to fuzzyify the augmented data

set using the plurality of membership functions, and determine a likelihood that a fault as occurred in the turbine engine. Applicants can find no teaching of any membership functions or the use membership functions to determine a likelihood that a fault has occurred with regard to element 30.

As McBrien fails to teach a sensor data processor or fuzzy logic inference system as claimed, applicants submit that independent claim 1 is patentably distinct over McBrien. Furthermore, as claims 5, 6, 7, 9, 10 and 11 depend from, and include all the limitations of independent claim 1, they are also submitted to be patentably distinct.

Claims 31, 33, 34, 36-38 were rejected under 35 U.S.C. § 103 as allegedly being unpatentable over McBrien in view of Martucci (U.S. Patent No. 6289274). Applicants again disagree, and submit that the Martucci reference thus does not overcome the deficiencies in McBrien noted above. Claims 39-45 were likewise rejected under 35 U.S.C. § 103 as allegedly being unpatentable over McBrien in view of Brown (U.S. Patent No. 53771112). Applicants again disagree, and submit that the Brown reference does not overcome the deficiencies in McBrien noted above. Furthermore, Brown fails to teach the specific calculation of exhaust gas temperature residuals, engine speed residuals or fuel flow residuals, as was alleged by the Examiner.

IV. Conclusion

In view of the foregoing, it is submitted that the Examiner's reliance upon McBrien does not support rejection of claims and that the above-noted rejections should be withdrawn.

Respectfully submitted,
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